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IN SERVICE TRAINING IN COMPUTER ASSISTED INSTRUCTION FOR
VOCATIONAL TEACHERS. FINAL REPORT.

BY- REYNOLDS, ROBERT R.

PROVIDENCE COLL., R.I., COMPUTER CENTER

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DESCRIPTORS- *COMPUTER ASSISTED INSTRUCTION, *CURRICULUM
DEVELOPMENT, COURSE CONTENT, *VOCATIONAL EDUCATION,
*PROGRAMING PROBLEMS, *TEACHER EDUCATION,

THIRTEEN TEACHERS USED COMPUTER ASSISTED INSTRUCTION TO
WRITE AND STORE THEIR OWN PROGRAMS OF COURSE WORK IN
VOCATIONAL EDUCATION. ALTHOUGH TECHNICAL DIFFICULTIES AND
TIME DELAYS WERE ENCOUNTERED, IT WAS CONCLUDED THAT MOST OF
THE TEACHERS BENEFITTED FROM THIS INTRODUCTION TO COMPUTER
ASSISTED INSTRUCTION. (LH)

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COMPUTER ASSISTED INSTRUCTION



PROVIDENCE COLLEGE COMPUTER CENTER

U. S. OFFICE OF EDUCATION

CONTRACT

OE - 7 - 062811 - 0016

Final Report

Project No. 6-2811.

TITLE: "In Service Training in Computer Assisted Instruction for Vocational Teachers."

AUTHOR: Robert R. Reynolds

INVESTIGATOR: G. C. McGregor, O.P.

GRANT NUMBER: OEG1-7-062811-0016
Vocational Education Act of 1963,
P. L. 88-210, Sec 4 (c)

GRANTEE INSTITUTION: Providence College
Providence, Rhode Island

DATE: July 13, 1966--October 15, 1966

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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EM006 039

SUMMARY OF PROJECT NO. 6-2811

GRANT NUMBER: OEG1-7-062811-0016

TITLE: "In Service Training in Computer Assisted Instruction for Vocational Teachers."

INVESTIGATOR: G. C. McGregor, O. P.

INSTITUTION: Providence College
Providence, Rhode Island

DURATION: July 13, 1966--October 15, 1966

PURPOSE: The purpose of this project was to allow the participants to revise, rewrite, and evaluate course material in hopes of producing one unit or semester of work in Computer Assisted Instruction mode.

PROCEDURE: Formal instruction in the use of the Coursewriter Language and discussion periods were conducted four evenings per week, for two hours each evening. Each participant was required to attend these sessions. At his convenience, each participant was required to schedule two hours of computer time to be used to test stored materials and revise or enter new course data. Any procedural difficulties encountered during the entry or testing of material were discussed at the evening sessions. Many of the recommendations and guidelines for future programs resulted from these discussion periods.

RESULTS AND CONCLUSIONS:

This project was the third phase in a proposed five phase project which was hoped to result in a vocational education curriculum for junior and senior high school students. The third phase was designed to produce course material which would be used to test student progress, or the lack thereof, when instruction was presented in Computer Assisted Instruction mode. Although we realize that the scope of our objective, to produce one semester of work, was too broad to be wholly achieved, we feel that several participants have made significant progress in realizing the spirit of this objective. (See Appendix 1.)

1. Each participant entered some portion of his program.

2. Most participants wrote and planned material in excess of the amount he was able to enter.
3. Additional experience gave rise to a good deal of revision and expansion of previously entered material.
4. Many participants assisted each other by acting in the role of students to test previously entered material. This brought to light problems in the selection of wording in both directions and text material, in formatting of text material, and in the need for expanded use of functions.
5. Several visitors to the computer center were allowed to try course material and were enthusiastic about the potential of CAI. (See Appendix 2.)
6. Provision has been made in many programs for the use of the tape recorder and slide projector features of our system.
7. Each participant developed a high degree of proficiency in the following CAI skills:
 - a. Initializing the system.
 - b. Inserting and deleting course material.
 - c. Polling the units of the system.
 - d. Functioning in the role of the author, student, and the proctor.
8. Many participants continued working on their programs well beyond the six week workshop period. Several continued through the Labor Day weekend.

The process of learning to write effective programs in Computer Assisted Instruction mode is a very slow process. Continual revision is necessary as an author reaches new plateaus of understanding and proficiency revealing inadequacies of the past. The author must assume an active and self-directing role. His best support is the stimulation provided by the company of others similarly engaged in CAI.

The amount of time and effort expended by the participants in this project attest to the ability of CAI to capture the imagination and to provide a continuing motivating force, despite failures of equipment and frustration of constant revision of materials. It is our belief that the enthusiastic reception by the participants and visitors, who have been able to be engaged in CAI, indicates the future effectiveness of the computer in education.

It is the belief of the participants that the discipline imposed by their individual CAI projects--being com-

pelled to view a curriculum as a detailed, preplanned entity--has produced a heightened appreciation of the learning process and improved their effectiveness as teachers.

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STATEMENT OF PURPOSE

The purpose of this project covering the period of July 13, 1966 to October 15, 1966 was to test and evaluate course sectors leading to the development of one semester courses which would be used in establishing a Computer Assisted Instruction Curriculum in vocational education for junior and senior high school students.

GENERAL OBJECTIVES

1. To test and evaluate course material.
2. To revise and expand previously written material.
3. To develop proficiency in the use of the Computer Assisted Instruction system as a proctor, an author, and as a student.
4. To develop a better appreciation in the problems of developing a curriculum in Computer Assisted Instruction mode.

SPECIFIC OBJECTIVES

1. Each participant was to complete the writing of one unit or semester of material in his particular course area.
2. Each participant was to enter as much of his course material as possible on the disk storage unit.
3. Each participant would select two high school students to test his course material.
4. Each participant would utilize the record of student responses to evaluate his course material.

DESCRIPTION OF PROJECT

The project was directed by the Rev. G. C. McGregor, O.P. and supervised and coordinated by Mr. Paul Bartolomeo. Workshop periods were conducted on Monday through Thursday from 7:00 to 9:00 PM July 5 to August 12, 1966. These evening sessions were conducted in the workshop style, except that two hours was reserved for formal instruction in the Coursewriter language. Due to the fact that only two terminals were available, participants were required to schedule two hours of computer time outside of the normal class hours to enter and test their course material.

One hour of each evening session was devoted to the accomplishment of our general objectives of developing proficiency in role of the author, proctor and student on the system. The remaining hour was used for discussion, conferences with the instructor, working alone, or observation of other participants utilizing the system.

About August 1, 1966, a new method of entering course material into storage was made available by the University of Texas. This method enabled the participants to write their course material on coding sheets and to have this material punched into cards. However, our equipment would not accept this method and IBM technicians had to be called upon to make necessary adjustments. Unfortunately, this work could not be completed before the end of the workshop period. We did begin formal instruction in the use of the coding sheets so that as soon as the system was adjusted, course material could be entered by this media.

Each participant was evaluated by the director and coordinator of the project. Quality of written material, degree of professional improvement, proficiency in use of the equipment, and demonstration of interest as evidenced by independent pursuit of learning, extra hours of work, superior degree of workshop participation, and attitude were considered in obtaining the participant's final grade.

STUDENT SELECTION

The thirteen vocational education teachers who participated in this project are the same participants who took part in earlier phases of this project under U. S. Office of Education contracts OE-5-85-105 and OE-6-85-093. All members of this group were selected on the basis of their scores on the IBM Programmers Aptitude Test. The names of the participants will be found in Appendix V.

PROJECT EVALUATION

The project was not free from technical difficulties inherent in experimental situations. Repeated equipment failure shut down the system many days and snarled input. Some logic difficulties in the Coursewriter language were encountered. Disks damaged in transit required re-entering. As a result, the entering and testing of course sectors fell well behind schedule. This caused problems in motivation for the authors. A more detailed explanation of the technical difficulties may be found in Appendix 8.

The stated objective of completing a semester's course appears to have been too ambitious. As the work progresses, there is an increasing realization that a great deal of time is required to produce a CAI course approaching professional quality. Anywhere from 50 to 150 hours is required to produce a forty minute lesson. Much of this time is taken up in revising, rewriting, and re-entering data in addition to writing and entering new material. Many of the participants worked well beyond the grant period, several right through Labor Day weekend.

The manner in which classes were conducted seems to have achieved the kind of atmosphere that was desired. Teachers were able to pursue that which was of immediate concern to them. They shared their experience by giving others their perspectives and opinions. Programming problems were solved with individual guidance from the instructor. Extemporaneous group or class discussions delved into matters of common concern. It is felt that more formal methods tend to discourage individual involvement, discovery, and creativity, and to distort specialized subject matter into stereotyped and inappropriate patterns.

We feel that the following results have been achieved:

1. Each participant entered some portion of his program.
2. Most participants wrote and planned material in excess of the amount he was able to enter.
3. Additional experience gave rise to a good deal of revision and expansion of previously entered material.
4. Many participants assisted each other by acting in the role of students to test previously entered material. This brought to light problems in the selection of wording in both directions and text material, in formatting of text material, and in the need for expanded use of functions.
5. Several visitors to the computer center were allowed to try course material and were enthusiastic about the potential of CAI. (See Appendix 2.)
6. Provision has been made in many programs for the use of the tape recorder and slide projector features of our system.
7. Each participant developed a high degree of proficiency in the following CAI skills:
 - a. Initializing the system.
 - b. Inserting and deleting course material.
 - c. Polling the units of the system.
 - d. Functioning in the role of the author, student, and the proctor.
8. Many participants continued working on their programs well beyond the six-week workshop period. Several continued through the Labor Day weekend.
9. Each participant has become familiar with the new punch card method of inputting course material.

We definitely believe that the batch-load method, punch card method, of inputting course material offers tremendous advantages over the entering of material through the 1050 Communications Terminal. As stated in our report, under U. S. Office of Education Contract OE-6-85-093, the 1050 Communications Terminal is not an efficient method of input unless the author has the ability to type. No consideration was given to the participants' typing ability as a prerequisite to admission to the project. Although the necessary adjustments needed to adapt our equipment to accept the batch-load method were not completed before the end of the grant period, many participants had begun to write course material for entry by this method.

CONCLUSIONS

The project has satisfied most of the general and specific objectives stated in this report. We do feel that the objectives of producing a full semester of work and a vocational education curriculum are much too ambitious for a project of this nature. 50 to 150 hours of work are required to produce one 40-minute class lesson. Considering the participants spent 15 hours in preparation each week, outside of the required attendance, in six weeks, only one to one and one half class lessons could have been prepared. This would be far less than that required for one semester let alone a full curriculum.

The most important single impediment in preventing this project from progressing at a higher rate of efficiency was the lack of reliability of our CAI equipment. Most participants wrote far more material than could be entered. Yet, even the data which was entered was, in several instances, destroyed by equipment malfunction. The idea of presenting demonstrations for high ranking school administrators was approached cautiously for fear of adverse reaction due to the unreliability of the equipment. Several authors experienced so much difficulty, they would not bring their students to test material. Finally, we experienced a severe problem in morale among the participants themselves.

One difficulty which we have mentioned in previous reports seems to have been overcome. The development of the batch-load method of entering course material should enable the authors to enter data at a higher rate. In addition, plans have been made to store data on punched cards at periodic intervals, and on magnetic tape before each author work period. After the work period, the updated course will be entered on magnetic tape by the technical personnel to provide a back-up system. These procedures should prevent the destruction of previously entered materials, and an efficient re-entry method will be established in the event of equipment malfunction.

In spite of the problems, which are not unusual in an experimental situation, we are confident that Computer Assisted Instruction provides the most versatile teaching aid to be yet devised. The teacher is freed from the dual task of information transmission and drill. His creative talents can now be utilized to provide instruction for the gifted or exceptional students. The student is required to assume an active role at all times, and the program is tailored to allow him to progress at his own pace. This continual involvement and the immediate knowledge of success or failure should prove to be a positive motivational force.

RECOMMENDATIONS

1. A technical bulletin should be instituted as soon as possible.
2. A users group should be started among the various colleges and universities in Rhode Island which have CAI compatible equipment.
3. More realistic objectives should be established.
4. A review of present equipment should be made, especially the student terminals.
5. There should be coordination, through the U.S. Office of Education, to keep participants in various CAI projects abreast of the newest developments in the field.
6. Individual initiative should be encouraged in entering and testing materials.
7. One session a month should be utilized to document difficulties experienced by the participants with either Coursewriter or the terminal equipment.
8. Visitors should be encouraged to test CAI as soon as equipment is proven reliable.
9. An inservice program for teachers in other fields should be instituted. This could be done with or without equipment.

GUIDELINES

1. Formal instruction in the use of Coursewriter should be continued with special emphasis on the use of functions.
2. The workshop approach should be utilized.
3. All course material should be written prior to formal workshop or class sessions.
4. Authors should be required to utilize the batch-load method of entry. The 1050 terminal use should be limited to testing and minor corrections of format or logic.
5. Author logs for both time spent in preparing material and problems encountered in entering or testing data should be maintained weekly.
6. New participants should be solicited, utilizing the previous participants as instructors.
7. Outside evaluation of course material should be obtained.
8. The objective of producing a single semester of work should be maintained, but the objective of producing a vocational education curriculum in Computer Assisted Instruction mode should be dropped.
9. Future programs should make provision for typists or require the participants to be able to type.
10. Participants should be appraised as to the number of hours of commitment that will be required.

APPENDIX I

Sample course sections completed during the July to August, 1966,
phase of the project in Computer Assisted Instruction.

demo1,s1100

your name is R. R. Reynolds ds1
Introduction to Data Processing

Prepared by

Mr. Robert R. Reynolds

for

Computer Assisted Instruction

Providence College

Providence, Rhode Island

1965--1966

You are about to begin a course designed to introduce you to some of the automated devices used to process data. The course is divided into three basic sections:

1. Simple devices
2. Unit Record Equipment
3. Electronic Computer

Please depress the response key [Altn coding and 5].

The objective of this section is to acquaint you with some of the simple automated devices used in the modern business world. Carbon paper is the simplest automated device. The impression of the original is transferred to a copy by the carbon automatically.

Sensitized paper, developed by the National Cash Register Company, is our next simple device. This paper is treated with chemicals. Original impressions are transferred automatically to the copies without the smudging or mess of carbon paper.

Our next device is familiar to most people. Credit cards, charge account plates, name and address plates, etc., are forms of the embossed plate. Embossed plates are made of plastic or metal. Data on the plate is raised or embossed. Carbon paper or an inked ribbon is placed between the document and the plate. Pressure is applied by a roller, and the data is transferred.

Please key an eob [altn coding and 5].

Indicate your answers by using the LETTER ONLY.

Which of the following is the simplest form of automated device used in today's business office?

- [a] Embossed plate
- [b] Sensitized paper
- [c] Punched card
- [d] Carbon paper

b

b - not accepted

Incorrect. Try again.

a

a - not accepted

Incorrect. Did you follow the directions carefully? Try again.

d

Very good. Let's go on.
Paper that has been treated with chemicals and is used to make copies of an original document is called:

- [a] Carbon paper
- [b] Inked paper
- [c] Sensitized paper
- [d] Copy paper

c

Very good.

The impression of an ----- is made by means of a pressure roller and carbon paper or inked ribbon.

- [a] Embossed plate
- [b] Identification cards
- [c] Invoice
- [d] Order

a

Fine. Now you are ready to go on to the next assignment.

Another simple automated device is the pegboard. A pegboard is a flat writing surface with numbered pegs or posts along one side. Forms are punched with holes to match the pegs for alignment.

Look at the first illustration. When you are ready to go on, key an eob [altn coding and 5].

Data is transferred from one form to another by carbon or sensitized paper. The master list is placed on the pegboard first. Then the carbon paper is placed on top. Each additional form is then placed on top. The original is the last to be set on the pegboard. All forms to be used must be coordinated.

Each original is aligned to the pegs in descending order. As our illustration demonstrates, each check would be placed on the pegboard a bit lower than the one before it. When we are finished, we will have a master list or listing without having to copy the data from the original several times.

Please key an eob.

//ss002x//

Indicate your answer by typing the word or words that identify your selection.

A flat writing surface with numbered pegs along one edge is known as a -----.

pegboard

Data on the original is transferred to a copy or master list by means of -----.

carbon paper

Forms are aligned or lined up by using the numbered ----- along the edge of the board.

pegs

That's it, You are doing well. Keep it up.

The advantage of using a pegboard is that we may have a copy or

a ----- without having to rewrite the data on the original document.

master list

Forms used with the pegboard are aligned with the pegs on the board by means of ----- on the edge of the form.

holes

Fine. Your answer is correct. Let's try the next section.

Our final simple device is a bit more complex than the others. The Keysort Process uses a card with holes punched on the edges of the card.

Please turn to the second illustration.

Information is recorded on the card by notching the holes. These holes may be grouped together to represent data. Holes grouped in this manner are called code fields. The number of holes in each group may vary to meet the needs of the user. A code known as the binary code is used to represent data. Only numeric data may be recorded.

When you are ready to go on, please key an eob.

In order to sort or select data from the cards, we pass a steel rod or needle through the holes in the edge of a deck of cards. The cards that have been notched will fall from the needle, and the unnotched cards will remain on the needle. This procedure will be followed for each position in the code field. Once data has been recorded manually into the cards, the sorting or selection of data is automatic.

Please key an eob.

Supply only the LETTER that indicates your answer.

The fields on a keysort card are:

- [a] on the top
- [b] on the edge
- [c] in the middle
- [d] all over the card

c
sorry, but that's not it. Try once more.

b
Very good. Let's go on to the next question.

//ss009 //Note that the picture of the Keysort card shows that the school code has been notched.

What is the school number that has been notched into the card?

help

24

24

If the keysort needle is passed through a deck of cards, and this card was in the deck, would it fall into the tray or remain on the needle if you wanted schools 10-19?

remain on the needle

If we want to identify the cards used to register boys from those used to register girls, only one position or code field would be necessary. The cards used for boys could be notched, and the ones used for girls would not be notched.//ss010x//

Therefore, boys' cards would fall to the tray and the girls' cards would -----.
remain

The keysort process is the first of our simple automated devices for processing data that resembles the equipment used in card processing systems of today. Our next section will be on unit record systems of processing data. Before we can go on to our new work, we will have a short quiz on the material we have already covered.

If you wish to take the quiz, please type yes. If you do not wish to take the quiz at this time, please type no.

yes

1. The simplest form of automated device is -----.

help

No help given.

carbon paper

Try the next one.

2. Name one other simple automated device.

embossed plate

Let's go on.

3. A credit card is a form of the -----.
embossed plate

Try the next question.

4. The ----- uses numbered pegs to align forms.
peg board

Each answer is being recorded. You may obtain your score at
the end of the test from your instructor.

5. The holes around the edge of the ----- card are notched to
record data.

keysort

Go on.

6. Although data is recorded manually on the keysort card, the
selection or sorting of cards is -----.

automatic

Next question.

7. The unnotched holes on the keysort card cause the cards to
----- on the needle.

stay

You have completed the quiz.

Would you like to know your score? Type yes or no.

yes

You received an A. Let's go on to the next section. Please
depress the a key.

a

Section 2

We can conclude from the previous section on simple devices that automation
is not a machine. Rather it is a process. The chief aim of automation is to
reduce human effort and handling to obtain less error. The secondary aim is to
increase the processing speed. We shall now attempt to apply the principles of
automation to Data Processing.

Data processing is the processing of information. The huge volumes of data
that must be handled every day by business, science and government staggers the
imagination. It is physically impossible to process, catalogue and store all the
vast quantities of information accumulated by all sources without the help of machines.
Automated equipment enables us to gather data, manipulate it, draw conclusions
from it, and store it for future use. Routine handling can be performed at high
speeds, freeing men and women for more important tasks. These machines can do many
of the tasks that humans find boring without becoming bored. Because our machines
do not become bored or tired, they make very few mistakes. Most errors that do
occur are the result of human error or machine malfunction.

All information handling, or data processing, goes through a cycle. First,
the data to be processed must be assembled. Then it must be recorded in a convenient
form. Next, it must be manipulated. The results must be reported. Finally,
it must be stored. The next slide shows the data processing cycle in sequence.
Please depress the response key.

//ss010 //

end of course.

you have been signed off.

demol,a0001
your name is
type control word
type reyn//finish
reyn
begin

R. R. Reynolds

1 rd Introduction to Data Processing
2
3 Prepared by
4
5 Mr. Robert R. Reynolds
6
7 for
8
9 Computer Assisted Instruction
10
11 Providence College
12
13 Providence, Rhode Island
14
15 1965--1966

16
17 You are about to begin a course designed to introduce you to some of
18 the automated devices used to process data. The course is divided into
19

20
21 three basic sections:

- 22 1. Simple devices
23
24 2. Unit Record Equipment
25
26 3. Electronic Computer
27

28 Please depress the response key [Altn coding and 5].
29

secla

1 rd The objective of this section is to acquaint you with some
2 of the simple automated devices used in the modern business world.
3 Carbon paper is the simplest automated device. The im-
4 pression of the original is transferred to a copy by the carbon
5 automatically.
6 Sensitized paper, developed by the National Cash Register
7 Company, is our next simple device. This paper is treated
8 with chemicals. Original impressions are transferred automa-
9 tically to the copies without the smudging or mess of carbon paper.
10 Our next device is familiar to most people. Credit cards, charge
11 account plates, name and address plates, etc., are forms of the
12 embossed plate. Embossed plates are made of plastic or metal.
13 Data on the plate is raised or embossed. Carbon paper or an
14 inked ribbon is placed between the document and the plate.
15 Pressure is applied by a roller, and the data is transferred.
16 Please key an eob [altn coding and 5].

seclaql

1 qu Indicate your answers by using the LETTER ONLY.
2
3 Which of the following is the simplest form of automated device used in to-
4 day's business office?
5 [a] Embossed plate
6 [b] Sensitized paper
7 [c] Punched card
8 [d] Carbon paper

8 ca d
 9 cb D
 10 ty Very good. Let's go on.
 11 wa carbon paper
 12 wb Carbon paper
 13 wa cbn ppr
 14 fn kl //2nt//Typing error.
 15 ty Incorrect. You did not follow directions. You were asked to use the LETTER
 16 only to indicate your answer. Please follow directions and try again.
 17 un Incorrect. Try again.
 18 un Incorrect. Did you follow the directions carefully? Try again.
 19 un Incorrect. The correct answer is d, carbon paper. Let's be a bit more

 20 careful when reading and make sure you follow the directions. Go on to
 21 the next question.
 22 br seclaq2
 seclaq2
 1 qu Paper that has been treated with chemicals and is used to make copies of
 2 an original document is called:
 3 [a] Carbon paper
 4 [b] Inked paper
 5 [c] Sensitized paper
 6 [d] Copy paper
 7 ca c
 8 cb C
 9 ty Very good.
 10 wa sensitized paper
 11 wb Sensitized paper
 12 wa sens ppr
 13 fn kl //2nt//Typing error.
 14 ty You did not follow directions. Use the LETTER ONLY! Try again.
 15 un Sorry. Try again.
 16 un The correct answer is c, sensitized paper. Go on to the next question.
 17 br seclaq3
 seclaq3
 1 qu The impression of an ----- is made by means of a pressure roller
 2 and carbon paper or inked ribbon.
 3 [a] Embossed plate
 4 [b] Identification cards
 5 [c] Invoice
 6 [d] Order
 7 ca a
 8 cb A
 9 ty Fine. Now you are ready to go on to the next assignment.
 10 wa embossed plate
 11 wb Embossed plate
 12 wa embsd plt
 13 fn kl //2nt//Typing error.
 14 ty You did not follow directions. Use only the LETTER. Try
 15 again.
 16 un Afraid not. Try again.
 17 un What happened!! That's not right either. Try once more.
 18 un Nope. You should have answered a, embossed plate. Let's
 19 try the next assignment.
 20 br seclb
 seclb
 1 rd
 2 Another simple automated device is the pegboard. A peg-
 3 board is a flat writing surface with numbered pegs or posts along
 4 one side. Forms are punched with holes to match the pegs for
 5 alignment.
 6 Look at the first illustration. When you are ready to go

```

7      on, key an eob [altn coding and 5].
8      rd      Data is transferred from one form to another by carbon or
9              sensitized paper. The master list is placed on the pegboard
10             first. Then the carbon paper is placed on top. Each addi-
11             tional form is then placed on top. The original is the last to
12             be set on the pegboard. All forms to be used must be coordi-
13             nated.
14             Each original is aligned to the pegs in descending order.
15             As our illustration demonstrates, each check would be placed on
16             the pegboard a bit lower than the one before it. When we are
17             finished, we will have a master list or listing without having to
18             copy the data from the original several times.
19             Please key an eob.
20      ty //ss002x//

sec1bq1
1      qu      Indicate your answer by typing the word or words that identify
2              your selection.
3              A flat writing surface with numbered pegs along one edge is
4              known as a -----,
5      ca      no help given.

6      ca      pegboard
7      cb      Pegboard
8      ca      pgbd
9      fn      kl      //1nt//Watch your typing.
10     ty      You are correct.
11     wa      peg board
12     wb      Peg board
13     wa      pg bd
14     fn      kl      //2nt//Typing error.
15     ty      Okay, but pegboard is one word.
16     br      sec1bq2
17     un      This answer is not correct. Remember that typing errors are

18             considered as incorrect answers. Try again.
19     un      I'm afraid not. LET'S GO BACK AND READ AGAIN.
20     br      sec1b

sec1bq2
1      qu      Data on the original is transferred to a copy or master list
2              by means of -----,
3      ca      no help given.

4      ca      carbon
5      cb      carbon paper
6      ca      cbn pr
7      fn      kl      //2nt//Be careful of typing errors.
8      cb      sensitized paper
9      cb      sens pr
10     fn      kl      //2nt//Watch your typing errors.
11     cb      carbon or sensitized paper
12     cb      sensitized or carbon paper
13     cb      cbn or sens pr
14     fn      kl      //4nt//Typing error.
15     fn      editls    //sh//c/r
16     ty      Your answer is correct. Let's go on.
17     un      Wrong. LET'S TRY AGAIN.
18     un      Check your typing and try again.
19     un      Sign off and get help from your instructor.

sec1b q3
1      qu      Forms are aligned or lined up by using the numbered ----- along
2              the edge of the board.
3      ca      no help given.

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```

4      ca posts
5      cb pegs
6      cb pegs or posts
7      cb posts or pegs
8      fn editls //sh//c/r
9      ty That's it, You are doing well. Keep it up.
10     un That's not it. Try once more.
11     un What's the matter? That is not the correct answer. Let's go on anyway and see if you cannot do better.
12     hr sec1b q4
sec1b q4
1      qu The advantage of using a pegboard is that we may have a copy or
2      a ----- without having to rewrite the data on the original document.
3      ca no help given.

4      ca master list
5      cb master
6      ca mstr lst
7      fn kl //2nt//Be careful of typing errors.
8      ca listing
9      ca lstg
10     fn kl //1nt//Watch typing errors.
11     fn editls //sh//c/r
12     wa duplicate
13     fn editls //sh//c/r
14     ty This is a good try, but I was looking for a term mentioned in the text.
15     Try again.
16     un This answer is not correct. Try again.
17     un We still can't seem to get together. Try once more.
18     un The correct answer is master list. Let's go on.
19     hr sec1b q5
sec1b q5
1      qu Forms used with the pegboard are aligned with the pegs on the board by means
2      of-----on the edge of the form.
3      ca no help given.

4      ca punched holes
5      fn editls //sh//sp//c/r
6      ca holes
7      fn editls //sh//c/r
8      ty Fine. Your answer is correct. Let's try the next section.
9      un Sorry, try again.
10     un Sign off and see your instructor.
sec1c
1      rd Our final simple device is a bit more complex than the
2      others. The KeySort Process uses a card with holes punched on
3      the edges of the card.
4      Please turn to the second illustration.
5      rd Information is recorded on the card by notching the holes.
6      These holes may be grouped together to represent data. Holes
7      grouped in this manner are called code fields. The number of
8      holes in each group may vary to meet the needs of the user. A
9      code known as the binary code is used to represent data. Only
10     numeric data may be recorded.
11     When you are ready to go on, please key an eob.
12     rd In order to sort or select data from the cards, we pass a
13     steel rod or needle through the holes in the edge of a deck of
14     cards. The cards that have been notched will fall from the
15     needle, and the unnotched cards will remain on the needle. This
16     procedure will be followed for each position in the code field.
17     Once data has been recorded manually into the cards, the sort-
18     ing or selection of data is automatic.
19     Please key an eob.

```

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19           Please key an eob.
sec1c q1
1      qu Supply only the LETTER that indicates your answer.
      The fields on a keysort card are:
2              [a] on the top
3              [b] on the edge
4              [c] in the middle
5              [d] all over the card
6      ca b
7      fn edit1s //sh//c/
8      ty Very good. Let's go on to the next question.
9      wa d
10     ty This is not quite correct, but why don't you try again.
11     un sorry, but that's not it. Try once more.
12     un The correct answer is b, on the edge. Go on to the next
13         question.
14     br sec1c q2
sec1c q2
1      qu //ss009 //
2      Note that the picture of the Keysort card shows that the school
3      code has been notched.
4      What is the school number that has been notched into the card?
5      ca 24
6      ca twentyfour
7      fn edit1s //sh//sp//c/r
8      un Did you look at the school code? Try again.
9      un Try 24.
sec1c q3
1      qu If the keysort needle is passed through a deck of cards, and this card
2      was in the deck, would it fall into the tray or remain on the needle if
3      you wanted schools 10-19?
4      ca remainontheneedle
5      fn edit1s //all
6      ca remain
7      fn edit1s //sh//c/r
8      ty We can also conclude from your answer that this card must contain data
9      concerning some other school. So it is possible to obtain two types
10     of data from the keysort card--positive or negative.
11     un Unnotched cards would remain on the needle. Notched cards would fall
12         to the tray.
13     br sec1c q4
sec1c q4
1      qu If we want to identify the cards used to register boys from those used to
2      register girls, only one position or code field would be necessary. The
3      cards used for boys could be notched, and the ones used for girls would not
4      be notched.//ss010x//
5      Therefore, boys' cards would fall to the tray and the girls' cards would
6      -----
7      ca remainontheneedle
8      fn edit1s //all
9      ca remain
10     fn edit1s //sh//c/r
11     un remain on the needle.
12     br sec1c q5
sec1c q5
1      qu The keysort process is the first of our simple automated devices for
2      processing data that resembles the equipment used in card processing systems
3      of today. Our next section will be on unit record systems of processing
4      data. Before we can go on to our new work, we will have a short quiz on
5      the material we have already covered.
6      If you wish to take the quiz, please type yes. If you do not wish to
7      take the quiz at this time, please type no.
8      ca yes
9      fn edit1s //sh//c/r

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10 wa no
11 fn editls //sh//c/r
12 ty When you are ready to take the quiz, please use the following format. Use
13 the control words--go to--and the label sec1test. You should copy this
14 format before signing off. Please sign off.
15 un Please type yes or no!

sec1test
1 qu 1. The simplest form of automated device is -----.
2 ca No help given.
3 ca carbonpaper
4 fn editls //all
5 ad 1//c1
6 ty Try the next one.
7 un Try the next one.
8 ad 1//c1
9 br test1q2

test1q2
1 qu 2. Name one other simple automated device.
2 ca No help given.
3 ca embossedplate
4 cb sensitizedpaper
5 cb pegboard
6 cb keysort
7 cb keysortprocess
8 fn editls //all
9 ad 1//c1
10 ty Let's go on.
11 un Let's go on.
12 ad 1//c2
13 br test1q3

test1q3
1 qu 3. A credit card is a form of the -----.
2 ca No help given.
3 ca embossedplate
4 fn editls //all
5 ad 1//c1
6 ty Try the next question.
7 un Try the next question.
8 ad 1//c2
9 br test1q4

test1q4
1 qu 4. The ----- uses numbered pegs to align forms.
2 ca No help given.
3 ca pegboard
4 fn editls //all
5 ad 1//c1
6 ty Each answer is being recorded. You may obtain your score at
7 ty the end of the test from your instructor.
8 un Each response is being recorded. You may obtain your score at
9 the end of the test from your instructor.
10 ad 1//c2
11 br test1q5

test1q5
1 qu 5. The holes around the edge of the ----- card are notched to
2 record data.
3 ca No help given.
4 ca keysort.
5 fn editls //all
6 ad 1//c1
7 ty Go on.
8 un Go on.
9 ad 1//c2
10 br test1q6

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testlq6
1      qu 6. Although data is recorded manually on the keysort card, the
2      selection or sorting of cards is -----.
3      ca No help given.
4      ca automatic
5      fn editls //all
6      ad 1//c1
7      ty Next question.
8      un Next question.
9      ad 1//c2
10     br testlq7
testlq7
1      qu 7. The unnotched holes on the keysort card cause the cards to
2      ----- on the needle.
3      ca No help given.
4      ca remain
5      cb stay
6      fn editls //all
7      ad 1//c1
8      ty You have completed the quiz.
9      un You have completed the quiz.
10     ad 1//c2
11     br testlend
testlend
1      qu Would you like to know your score? Type yes or no.
2      ca yes
3      br scrtld //4//c1
4      br scrtlc //5//c1
5      br scrtlb //6//c1
6      br scrtla //7//c1
7      ca no
8      ty You may obtain your score from your instructor at a later time.
9      rd Please depress the eob [altn coding and 5].
10     br sec2
scrtla
1      qu You received an A. Let's go on to the next section. Please
2      depress the a key.
3      ca a
4      br sec2
5      un Please depress the a key!
scrtlb
1      qu You received a B. Proceed to the next section. Please
2      depress the a key.
3      ca a
4      br sec2
5      un Please depress the a key!
scrtlc
1      qu You received a C. Proceed to the next section. Please
2      depress the a key.
3      ca a
4      br sec2
5      un Please depress the a key!
scrtld
1      qu You did not do too well. Your grade is a D. This means
2      you had 3 or more incorrect answers. Let's see if you can do a
3      better job on the next section. Please strike the a key.
4      ca a
5      br sec2
6      un Please strike the a key!

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sec2

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Section 2

We can conclude from the previous section on simple devices that automation is not a machine. Rather it is a process. The chief aim of automation is to reduce human effort and handling to obtain less error. The secondary aim is to increase the processing speed. We shall now attempt to apply the principles of automation to Data Processing.

Data processing is the processing of information. The huge volumes of data that must be handled every day by business, science and government staggers the imagination. It is physically impossible to process, catalogue and store all the vast quantities of information accumulated by all sources without the help of machines. Automated equipment enables us to gather data, manipulate it, draw conclusions from it, and store it for future use. Routine handling can be performed at high speeds, freeing men and women for more important tasks. These machines can do many of the tasks that humans find boring without becoming bored. Because our machines do not become bored or tired, they make very few mistakes. Most errors that do occur are the result of human error or machine malfunction.

All information handling, or data processing, goes through a cycle. First, the data to be processed must be assembled. Then it must be recorded in a convenient form. Next, it must be manipulated. The results must be reported. Finally,

it must be stored. The next slide shows the data processing cycle in sequence.

Please depress the response key.

ty //ss010 //

finish

type control word

sign off

you have been signed off.

EYN
EGIN
1 RD I NTRUCTION TO D ATA P ROCESSING *
2 *
3 P REPAED BY *
4 *
5 M R. R OBERT R. R EYNOLDS *
6 *
7 FOR *
8 *
9 C OMPUTER A SSISTED I NSTRUCTION *
10 *
11 P ROVIDENCE C OLLEGE *
12 *
13 P ROVIDENCE, R HODE I SLAND *
14 *
15 1965--1966 *
16 *
17 Y OU ARE ABOUT TO BEGIN A COURSE DESIGNED TO INTRODUCE YOU TO SOME OF *
18 *
19 THE AUTOMATED DEVICES USED TO PROCESS DATA. T HE COURSE IS DIVIDED INTO *
20 *
21 THREE BASIC SECTIONS 6 *
22 *
23 1. S IMPL E DEVICES *
24 *
25 2. U NIT R ECORD E QUIPMENT *
26 *
27 3. E LECTRONIC C OMPUTER *
28 *
29 P LEASE DEPRESS THE RESPONSE KEY 9A LTN CODING AND 5 0 . *
SECI A *
1 RD T HE OBJECTIVE OF THIS SECTION IS TO ACQUAINT YOU WITH SOME *
2 OF THE SIMPLE AUTOMATED DEVICES USED IN THE MODERN BUSINESS WORLD. *
3 C ARBON PAPER IS THE SIMPLEST AUTOMATED DEVICE. T HE IM- *
4 PRESSION OF THE ORIGINAL IS TRANSFERRED TO A COPY BY THE CARBON *
5 AUTOMATICALLY. *
6 S ENSITIZED PAPER, DEVELOPED BY THE N ATIONAL C ASH R EGISTER *
7 C OMPANY, IS OUR NEXT SIMPLE DEVICE. T HIS PAPER IS TREATED *
8 WITH CHEMICALS. O RIGINAL IMPRESSIONS ARE TRANSFERRED AUTOMA- *
9 TICALLY TO THE COPIES WITHOUT THE SMUDGING OR MESS OF CARBON PAPER. *
10 O UR NEXT DEVICE IS FAMILIAR TO MOST PEOPLE. C REDIT CARDS, CHARGE *
11 ACCOUNT PLATES, NAME AND ADDRESS PLATES, ETC., ARE FORMS OF THE *
12 E MBOSS ED PLATE. E MBOSS ED PLATES ARE MADE OF PLASTIC OR METAL. *
13 D ATA ON THE PLATE IS RAISED OR EMBOSSED. C ARBON PAPER OR AN *
14 INKED RIBBON IS PLACED BETWEEN THE DOCUMENT AND THE PLATE. *
15 P RESSURE IS APPLIED BY A ROLLER, AND THE DATA IS TRANSFERRED. *
16 P LEASE KEY AN EOB 9 ALTN CODING AND 5 0 . *
SECI AQI *
1 QU I NDICATE YOUR ANSWERS BY USING THE LETTER ONLY . *
2 W HICH OF THE FOLLOWING IS THE SIMPLEST FORM OF AUTOMATED DEVICE USED IN TO- *
3 DAY'S BUSINESS OFFICE / *
4 9 A 0 E MBOSS ED PLATE *
5 9 B 0 S ENSITIZED PAPER *
6 9 C 0 P UNCHED CARD *
7 9 D 0 C ARBON PAPER *

0203451
0203502
0203553
0203616
0203630
0203677
0203691
0203748
0203762
0203803
0203817
0203876
0203890
0203941
0203955
0204011
0204025
0204076
0204090
0204179
0204193
0204281
0204295
0204332
0204346
0204395
0204409
0204469
0204483
0204539
0204553
0204630
0264602
0264681
0264761
0264834
0264911
0264939
0265023
0265039
0265176
0265257
0265345
0264171
0264249
0264327
0264399
0264539
0205936
0205987
0206054
0206147
0206185
0206236
0206293
0206344

8	CA D*	0206395
9	CB D *	0206409
10	TY V ERY GOOD. L ET@S GO ON. *	0206425
11	WA CARBON PAPER*	0206466
12	WB C ARBUN PAPER*	0206491
13	WA CBN PPR*	0265422
14	FN KL //2NT// T YPING ERROR. *	0265442
15	TY I NCORRECT. Y OU DID NOT FOLLOW DIRECTIONS. Y OU WERE ASKED TO USE THE LETTER *	0206518
16	ONLY TO INDICATE YOUR ANSWER. P LEASE FOLLOW DIRECTIONS AND TRY AGAIN. *	0206614
17	UN I NCORRECT. T RY AGAIN. *	0206699
18	UN I NCORRECT. O IO YOU FOLLOW THE DIRECTIONS CAREFULLY / T RY AGAIN. *	0206738
19	UN I NCORRECT. T HE CORRECT ANSWER IS D, CARBON PAPER. L ET@S BE A BIT MORE *	0206820
20	CAREFUL WHEN READING AND MAKE SURE YOU FOLLOW THE DIRECTIONS. G O ON TO *	0206911
21	THE NEXT QUESTION. *	0206997
22	BR SEC1AQ2 *	0207029
SEC1AQ2	* P APER THAT HAS BEEN TREATED WITH CHEMICALS AND IS USED TO MAKE COPIES OF *	0207080
1	QU AN ORIGINAL DOCUMENT IS CALLED 6 *	0207131
2	9 A O C ARBON PAPER *	0207219
3	9 B O I NKEO PAPER *	0207266
4	9 C O S ENSITIZED PAPER *	0207317
5	9 D O C OPY PAPER *	0207367
6		0207422
7	CA C*	0207471
8	CB C *	0207485
9	TY V ERY GOOD. *	0207501
10	WA SENSITIZED PAPER*	0207527
11	WB S ENSITIZED PAPER*	0207556
12	WA SENS PPR*	0265488
13	FN KL //2NT// T YPING ERROR. *	0265509
14	TY Y OU DID NOT FOLLOW DIRECTIONS. U SE THE LETTER ONLY\$ T RY AGAIN. *	0207587
15	UN S ORRY. T RY AGAIN. *	0207669
16	UN T HE CORRECT ANSWER IS C, SENSITIZED PAPER. G O ON TO THE NEXT QUESTION. *	0207704
17	BR SEC1AQ3 *	0207792
SEC1AQ3	* T HE IMPRESSION OF AN ----- IS MADE BY MEANS OF A PRESSURE ROLLER *	0207843
1	QU AND CARBON PAPER OR INKEO RIBBON. *	0207894
2	9 A O E MBOSSED PLATE *	0207983
3	9 B O I DENTIFICATION CARDS *	0208030
4	9 C O I NVOICE *	0208083
5	9 D O O ROER *	0208142
6		0208188
7	CA A*	0208232
8	CB A *	0208246
9	TY F INE. N OW YOU ARE READY TO GO ON TO THE NEXT ASSIGNMENT. *	0208262
10	WA EMBOSSED PLATE*	0208336
11	WB E MBOSSED PLATE*	0208363
12	WA EMBSD PLT*	0265555
13	FN KL //2NT// T YPING ERROR. *	0265577
14	TY Y OU DID NOT FOLLOW DIRECTIONS. U SE ONLY THE LETTER . T RY *	0208392
15	AGAIN. *	0208469
16	UN A FRAIO NOT. T RY AGAIN. *	0208489
17	UN W HAT HAPPENED \$\$ T HAT@S NOT RIGHT EITHER. T RY ONCE MORE. *	0208529
18	UN N OPE. Y OU SHOULO HAVE ANSWERED A, EMBOSSED PLATE. L ET 6 S *	0208604
19	TRY THE NEXT ASSIGNMENT. *	0208683
20	BR SEC1B *	0208721
SEC1B	* RO *	0208772
1		0266858

2 A NOTHER SIMPLE AUTOMATED DEVICE IS THE PEGBOARD. A PEG- #
3 BOARD IS A FLAT WRITING SURFACE WITH NUMBERED PEGS OR POSTS ALONG #
4 ONE SIDE. FORMS ARE PUNCHED WITH HOLES TO MATCH THE PEGS FOR #
5 ALIGNMENT. #

6 LOOK AT THE FIRST ILLUSTRATION. WHEN YOU ARE READY TO GO #
7 ON, KEY AN EOB 9 ALTN CODING AND 5 0. #

8 RD DATA IS TRANSFERRED FROM ONE FORM TO ANOTHER BY CARBON OR #
9 SENSITIZED PAPER. THE MASTER LIST IS PLACED ON THE PEGBOARD #
10 FIRST. THEN THE CARBON PAPER IS PLACED ON TOP. EACH ADDI- #
11 TIONAL FORM IS THEN PLACED ON TOP. THE ORIGINAL IS THE LAST TO #
12 BE SET ON THE PEGBOARD. ALL FORMS TO BE USED MUST BE COORDI- #
13 NATED. #

14 EACH ORIGINAL IS ALIGNED TO THE PEGS IN DESCENDING ORDER. #
15 AS OUR ILLUSTRATION DEMONSTRATES, EACH CHECK WOULD BE PLACED ON #
16 THE PEGBOARD A BIT LOWER THAN THE ONE BEFORE IT. WHEN WE ARE #
17 FINISHED, WE WILL HAVE A MASTER LIST OR LISTING WITHOUT HAVING TO #
18 COPY THE DATA FROM THE ORIGINAL SEVERAL TIMES. #

19 PLEASE KEY AN EOB. #

20 TY //SS002X// #

SEC18Q1 #
1 QU I NDICATE YOUR ANSWER BY TYPING THE WORD OR WORDS THAT IDENTIFY #
2 YOUR SELECTION. #

3 A FLAT WRITING SURFACE WITH NUMBERED PEGS ALONG ONE EDGE IS #
4 KNOWN AS A -----. #

5 CA NO HELP GIVEN. #

6 CA PEGBOARD#

7 CB P EGBOARD#

8 CA PGBD#

9 FN KL //1NT// WATCH YOUR TYPING. #

10 TY YOU ARE CORRECT. #

11 WA PEG BOARD#

12 WB P EG BOARD#

13 WA PG BD#

14 FN KL //2NT// TYPING ERROR. #

15 TY O KAY, BUT PEGBOARD IS ONE WORD. #

16 BR SEC18Q2 #

17 UN THIS ANSWER IS NOT CORRECT. REMEMBER THAT TYPING ERRORS ARE #
18 CONSIDERED AS INCORRECT ANSWERS. TRY AGAIN. #

19 UN I AM AFRAID NOT. LETS GO BACK AND READ AGAIN. #

20 BR SEC1B #

SEC18Q2 #
1 QU DATA ON THE ORIGINAL IS TRANSFERRED TO A COPY OR MASTER LIST #
2 BY MEANS OF -----. #

3 CA NO HELP GIVEN. #

4 CA CARBON#

5 CB CARBON PAPER#

6 CA CBN PR#

7 FN KL //2NT// BE CAREFUL OF TYPING ERRORS. #

8 CB SENSITIZED PAPER#

9 CB SENS PR#

10 FN KL //2NT// WATCH YOUR TYPING ERRORS. #

11 CB CARBON OR SENSITIZED PAPER#

12 CB SENSITIZED OR CARBON PAPER#

13 CB CBN OR SENS PR#

14 FN KL //4NT// TYPING ERROR. #

15 FN EDIT15 //SH//C/R#

0265623
0265702
0265781
0265858
0265882
0265962
0266015
0266093
0266169
0266246
0266325
0266402
0266422
0266500
0266579
0266656
0266735
0266795
0266834
0210407
0210458
0210536
0210565
0210640
0210674
0210706
0210727
0266871
0266888
0210750
0210782
0210804
0266939
0266957
0210828
0210875
0210928
0211005
0211064
0211126
0211177
0211224
0211306
0211340
0211372
0211391
0267001
0267021
0211411
0267081
0267101
0211441
0211461
0267161
0267181
0211521

16 TY Y OUR ANSWER IS CORRECT. L ET@S GO ON. #
17 UN W RONG. LET@S TRY AGAIN. #
18 UN C HECK YOUR TYPING AND TRY AGAIN. #
19 UN S IGN OFF AND GET HELP FROM YOUR INSTRUCTOR. #
SEC18 Q3 #
1 QU F ORMS ARE ALIGNED OR LINED UP BY USING THE NUMBERED ----- ALONG #
2 THE EDGE OF THE BOARD. #
3 CA NO HELP GIVEN. #
4 CA POSTS#
5 CB PEGS#
6 CB PEGS OR POSTS#
7 CB POSTS OR PEGS#
8 FN EDITIS //SH//C/R#
9 TY T HAT@S IT, Y OU ARE DOING WELL. K EEP IT UP. #
10 UN T HAT@S NOT IT. T RY ONCE MORE. #
11 UN W HAT@S THE MATTER / T HAT IS NOT THE CORRECT ANSWER. L ET@S GO ON ANYWAY AND SEE IF
YOU CANNOT DO BETER. #
12 BR SEC18 Q4 #
SEC18 Q4 #
1 QU T HE ADVANTAGE OF USING A PEGBOARD IS THAT WE MAY HAVE A COPY OR #
2 A ----- WITHOUT HAVING TO REWRITE THE DATA ON THE ORIGINAL DOCUMENT. #
3 CA NO HELP GIVEN. #
4 CA MASTER LIST#
5 CB MASTER#
6 CA MSTR LST#
7 FN KL //2NT// B E CAREFUL OF TYPING ERRORS. #
8 CA LISTING#
9 CA LSTG#
10 FN KL //1NT// W ATCH TYPING ERRORS. #
11 FN EDITIS //SH//C/R#
12 WA DUPLICATE#
13 FN EDITIS //SH//C/R#
14 TY T HIS IS A GOOD TRY, BUT I WAS LOOKING FOR A TERM MENTIONED IN THE TEXT. #
15 T RY AGAIN. #
16 UN T HIS ANSWER IS NOT CORRECT. T RY AGAIN. #
17 UN W E STILL CAN G T SEEM TO GET TOGETHER. T RY ONCE MORE. #
18 UN T HE CORRECT ANSWER IS MASTER LIST. L ET@S GO ON. #
19 BR SEC18 Q5 #
SEC18 Q5 #
1 QU F ORMS USED WITH THE PEGBOARD ARE ALIGNED WITH THE PEGS ON THE BOARD BY MEANS #
2 OF-----ON THE EDGE OF THE FORM. #
3 CA NO HELP GIVEN. #
4 CA PUNCHED HOLES#
5 FN EDITIS //SH//SP//C/R#
6 CA HOLES#
7 FN EDITIS //SH//C/R#
8 TY F INE. Y OUR ANSWER IS CORRECT. L ET@S TRY THE NEXT SECTION. #
9 UN S ORRY, TRY AGAIN. #
10 UN S IGN OFF AND SEE YOUR INSTRUCTOR.#
SEC1C #
1 RD O UR FINAL SIMPLE DEVICE IS A BIT MORE COMPLEX THAN THE #
2 OTHERS. T HE K EYSORT P ROCESS USES A CARD WITH HOLES PUNCHED ON #
3 THE EDGES OF THE CARD. #
4 P LEASE TURN TO THE SECOND ILLUSTRATION. #
5 RD I NFORMATION IS RECORDED ON THE CARD BY NOTCHING THE HOLES. #
6 T HES@ H GLES MAY BE GROUPED TOGETHER TO REPRESENT DATA. H OLES #

021155
021160
021164
021169
021175
021180
021188
021192
021195
021197
021198
021201
021204
021207
021213
021218
021230
021236
021241
021249
021257
021260
021262
026723
026725
026731
026733
026735
021264
021267
021270
021273
021282
021284
021290
021297
021304
021309
021314
021322
021328
021331
021334
021337
021339
021341
021351
021354
021358
026741
02687
02675
02687
02676
02677

7 GROUPED IN THIS MANNER ARE CALLED CODE FIELDS. THE NUMBER OF *
8 HOLES IN EACH GROUP MAY VARY TO MEET THE NEEDS OF THE USER. A *
9 CODE KNOWN AS THE BINARY CODE IS USED TO REPRESENT DATA. ONLY *
10 NUMERIC DATA MAY BE RECORDED. *
11 WHEN YOU ARE READY TO GO ON, PLEASE KEY AN EOB. *
12 RD I MURDER TO SORT OR SELECT DATA FROM THE CARDS, WE PASS A *
13 STEEL ROD OR NEEDLE THROUGH THE HOLES IN THE EDGE OF A DECK OF *
14 CARDS. THE CARDS THAT HAVE BEEN NOTCHED WILL FALL FROM THE *
15 NEEDLE, AND THE UNNOTCHED CARDS WILL REMAIN ON THE NEEDLE. THIS *
16 PROCEDURE WILL BE FOLLOWED FOR EACH POSITION IN THE CODE FIELD. *
17 ONCE DATA HAS BEEN RECORDED MANUALLY INTO THE CARDS, THE SORT- *
18 ING OR SELECTION OF DATA IS AUTOMATIC. *
19 PLEASE KEY AN EOB. *

SECIC Q1 * THE FIELDS ON A KEYS
1 QU SUPPLY ONLY THE LETTER THAT INDICATES YOUR ANSWER.
ORI CARD ARE 6 *
2 9 A 0 ON THE TOP *
3 9 B 0 ON THE EDGE *
4 9 C 0 IN THE MIDDLE *
5 9 D 0 ALL OVER THE CARD *
6 CA B*
7 FN EDITIS //SH//C/R*
8 TY VERY GOOD. LETS GO ON TO THE NEXT QUESTION. *
9 WA D*
10 TY THIS IS NOT QUITE CORRECT, BUT WHY DONOT YOU TRY AGAIN. *
11 UN SORRY, BUT THATS NOT IT. TRY ONCE MORE. *
12 UN THE CORRECT ANSWER IS B, ON THE EDGE. GO ON TO THE NEXT*
13 QUESTION. *
14 BR SECIC Q2 *

SECIC Q2 *
1 QU //SS009 //*
2 NOTE THAT THE PICTURE OF THE KEYSORT CARD SHOWS THAT THE SCHOOL *
3 CODE HAS BEEN NOTCHED. *
4 WHAT IS THE SCHOOL NUMBER THAT HAS BEEN NOTCHED INTO THE CARD / *
5 CA 24*
6 CA TWENTYFOUR*
7 FN EDITIS //SH//SP//C/R*
8 UN DID YOU LOOK AT THE SCHOOL CODE / TRY AGAIN. *
9 UN TRY 24. *

SECIC Q3 *
1 QU IF THE KEYSORT NEEDLE IS PASSED THROUGH A DECK OF CARDS, AND THIS CARD *
2 WAS IN THE DECK, WOULD IT FALL INTO THE TRAY OR REMAIN ON THE NEEDLE IF *
3 YOU WANTED SCHOOLS 10-19 / *
4 CA REMAINTHENEEDLE*
5 FN EDITIS //ALL*
6 CA REMAIN*
7 FN EDITIS //SH//C/R*
8 TY WE CAN ALSO CONCLUDE FROM YOUR ANSWER THAT THIS CARD MUST CONTAIN DATA *
9 CONCERNING SOME OTHER SCHOOL. SO IT IS POSSIBLE TO OBTAIN TWO TYPES *
10 OF DATA FROM THE KEYSORT CARD--POSITIVE OR NEGATIVE. *
11 UN UNNOTCHED CARDS WOULD REMAIN ON THE NEEDLE. NOTCHED CARDS WOULD FALL *
12 TO THE TRAY. *
13 BR SECIC Q4 *

SECIC Q4 *
1 QU IF WE WANT TO IDENTIFY THE CARDS USED TO REGISTER BOYS FROM THOSE USED TO *
2 REGISTER GIRLS, ONLY ONE POSITION OR CODE FIELD WOULD BE NECESSARY. THE *

0267818
0267895
0267973
0268051
0268094
0268162
0268239
0268315
0268391
0268471
0268546
0268626
0268676
0214772
0214823

0214942
0214990
0215039
0215090
0215145
0215157
0215191
0215254
0215268
0215339
0215396
0215469
0215496
0215547
0215598
0215621
0215702
0215738
0215818
0215833
0215856
0215892
0215956
0215979
0216030
0216116
0216203
0216246
0216276
0216304
0216323
0216355
0216441
0216527
0216595
0216682
0216700
0216750
0216810
0216890

0216989
0217078
0217115
0217208
0217228
0217258
0217286
0217305
0217337
0217371
0217422
0217473
0217562
0217654
0217744
0217834
0217887
0217979
0218038
0218054
0218086
0218101
0218133
0218225
0218314
0218376
0218416
0218467
0218536
0218569
0218593
0218621
0218639
0218672
0218705
0218723
0218774
0218825
0218884
0218917
0218943
0218971
0218992
0219012
0219039
0219061
0219089
0219115
0219149
0219161
0219214
0219261
0219321
0219351
0219381
0219411

3 CARDS USED FOR BOYS COULD BE NOTCHED, AND THE ONES USED FOR GIRLS WOULD NOT *
4 BE NOTCHED.//SSOIOX// *
5 T HEREFURE, BOYS@ CARDS WOULD FALL TO THE TRAY AND THE GIRLS@ CARDS WOULD *
6 ----- *
7 CA REMAINCNTHENEEDLE*
8 FN EDIT1S //ALL*
9 CA REMAIN*
10 FN EDIT1S //SH//C/R*
11 UN REMAIN ON THE NEEDLE.*
12 BR SEC1C Q5 *
SEC1C Q5 *
1 QU T HE KEYSORT PROCESS IS THE FIRST OF OUR SIMPLE AUTOMATED DEVICES FOR *
2 PROCESSING DATA THAT RESEMBLES THE EQUIPMENT USED IN CARD PROCESSING SYSTEMS *
3 OF TODAY. O UR NEXT SECTION WILL BE ON UNIT RECORD SYSTEMS OF PROCESSING *
4 DATA. B EFCRE WE CAN GO ON TO OUR NEW WORK, WE WILL HAVE A SHORT QUIZ ON *
5 THE MATERIAL WE HAVE ALREADY COVERED. *
6 I F YOU WISH TO TAKE THE QUIZ, PLEASE TYPE YES. I F YOU DO NOT WISH TO *
7 TAKE THE QUIZ AT THIS TIME, PLEASE TYPE NO. *
8 CA YES*
9 FN EDIT1S //SH//C/R*
10 WA NO*
11 FN EDIT1S //SH//C/R*
12 TY W HEN YOU ARE READY TO TAKE THE QUIZ, PLEASE USE THE FOLLOWING FORMAT. U SE *
13 THE CONTROL WORDS--GC TO--AND THE LABEL SEC1TEST. Y OU SHOULD COPY THIS *
14 FORMAT BEFORE SIGNING OFF. P LEASE SIGN OFF. *
15 UN P LEASE TYPE YES OR NO \$ *
SEC1TEST *
1 QU 1. T HE SIMPLEST FORM OF AUTOMATED DEVICE IS ----- *
2 CA N O HELP GIVEN. *
3 CA CARBONPAPER*
4 FN EDIT1S //ALL*
5 AD 1//C1*
6 TY T RY THE NEXT ONE. *
7 UN T RY THE NEXT ONE. *
8 AD 1//C1*
9 BR TEST1Q2 *
TEST1Q2 *
1 QU 2. N AME ONE OTHER SIMPLE AUTOMATED DEVICE. *
2 CA N O HELP GIVEN. *
3 CA EMBOSSEDPLATE*
4 CB SENSITIZEDPAPER*
5 CB PEGBOARD*
6 CB KEYSORT*
7 CB KEYSORTPROCESS*
8 FN EDIT1S //ALL*
9 AD 1//C1*
10 TY L ET 6 S GO ON. *
11 UN L ET 6 S GO ON. *
12 AD 1//C2*
13 BR TEST1Q3 *
TEST1Q3 *
1 QU 3. A CREDIT CARD IS A FORM OF THE ----- *
2 CA N O HELP GIVEN. *
3 CA EMBOSSEDPLATE*
4 FN EDIT1S //ALL*
5 AD 1//C1*

6 TY TRY THE NEXT QUESTION. #
7 UN TRY THE NEXT QUESTION. #
8 AD 1//C2#
9 BR TEST1Q4 #
TEST1Q4 #
1 QU 4. THE ----- USES NUMBERED PEGS TO ALIGN FORMS. #
2 CA NO HELP GIVEN. #
3 CA PEGBOARD#
4 FN EDIT1S //ALL#
5 AD 1//C1#
6 TY EACH ANSWER IS BEING RECORDED. YOU MAY OBTAIN YOUR SCORE AT #
7 TY THE END OF THE TEST FROM YOUR INSTRUCTOR. #
8 UN EACH RESPONSE IS BEING RECORDED. YOU MAY OBTAIN YOUR SCORE AT #
9 THE END OF THE TEST FROM YOUR INSTRUCTOR. #
10 AD 1//C2#
11 BR TEST1Q5 #
TEST1Q5 #
1 QU 5. THE HOLES AROUND THE EDGE OF THE ----- CARD ARE NOTCHED TO #
2 RECORD DATA. #
3 CA NO HELP GIVEN. #
4 CA KEYSORT#
5 FN EDIT1S //ALL#
6 AD 1//C1#
7 TY GO ON. #
8 UN GO ON. #
9 AD 1//C2#
10 BR TEST1Q6 #
TEST1Q6 #
1 QU 6. ALTHOUGH DATA IS RECORDED MANUALLY ON THE KEYSORT CARD, THE #
2 SELECTION OR SORTING OF CARDS IS ----- . #
3 CA NO HELP GIVEN. #
4 CA AUTOMATIC#
5 FN EDIT1S //ALL#
6 AD 1//C1#
7 TY NEXT QUESTION. #
8 UN NEXT QUESTION. #
9 AD 1//C2#
10 BR TEST1Q7 #
TEST1Q7 #
1 QU 7. THE UNNOTCHED HOLES ON THE KEYSORT CARD CAUSE THE CARDS TO #
2 ----- ON THE NEEDLE. #
3 CA NO HELP GIVEN. #
4 CA REMAIN#
5 CB STAY#
6 FN EDIT1S //ALL#
7 AD 1//C1 #
8 TY YOU HAVE COMPLETED THE QUIZ. #
9 UN YOU HAVE COMPLETED THE QUIZ. #
10 AD 1//C2#
11 BR TEST1END #
TEST1END #
1 QU WOULD YOU LIKE TO KNOW YOUR SCORE / TYPE YES OR NO. #
2 CA YES#
3 BR SCRT1D //-4//C1#
4 BR SCRT1C //-5//C1#
5 BR SCRT1B //-6//C1#

0219428
0219466
0219504
0219522
0219573
0220000
0220065
0220098
0220119
0220147
0220165
0220243
0220298
0220378
0220433
0220451
0220502
0220553
0220631
0220657
0220690
0220710
0220738
0220756
0220778
0220800
0220818
0220869
0220920
0220999
0221052
0221085
0221107
0221135
0221153
0221183
0221213
0221231
0221282
0221333
0221411
0221445
0221480
0221499
0221516
0221544
0221624
0221668
0221712
0221730
0221781
0221832
0221903
0221919
0221978
0222037

6 BR SCRT1A // -7//C1+ 0222096
7 CA NO+ 0222155
8 TY Y OU MAY OBTAIN YOUR SCORE FROM YOUR INSTRUCTOR AT A LATER TIME. + 0222170
9 RD P LEASE DEPRESS THE EOB 9 ALTN CODING AND 5 0 . + 0222249
10 BR SEC2 + 0222312
SCRT1A + 0222363
1 QU Y OU RECEIVED AN A . L ET 6 S GO ON TO THE NEXT SECTION. P LEASE + 0222414
2 DEPRESS THE A KEY. + 0222498
3 CA A+ 0222530
4 BR SEC2 + 0222544
5 UN P LEASE DEPRESS THE A KEY \$ + 0222595
SCRT1B + 0222638
1 QU Y OU RECEIVED A B . P ROCEED TO THE NEXT SECTION. P LEASE + 0222689
2 DEPRESS THE A KEY. + 0222766
3 CA A+ 0222798
4 BR SEC2 + 0222812
5 UN P LEASE DEPRESS THE A KEY \$ + 0222863
SCRT1C + 0222906
1 QU Y OU RECEIVED A C . P ROCEED TO THE NEXT SECTION. P LEASE + 0222957
2 DEPRESS THE A KEY. + 0223034
3 CA A+ 0223066
4 BR SEC2 + 0223080
5 UN P LEASE DEPRESS THE A KEY \$ + 0223131
SCRT1D + 0223174
1 QU Y OU DID NOT DO TOO WELL. Y OUR GRADE IS A D . T HIS MEANS + 0223225
2 YOU HAD 3 OR MORE INCORRECT ANSWERS. L ET 6 S SEE IF YOU CAN DO A + 0223303
3 BETTER JOB ON THE NEXT SECTION. P LEASE STRIKE THE A KEY. + 0223364
4 CA A+ 0223456
5 BR SEC2 + 0223470
6 UN P LEASE STRIKE THE A KEY \$ + 0223521
SEC2 + 0223563
1 RD S ECTION 2 + 0223614
2 W E CAN CONCLUDE FROM THE PREVIOUS SECTION ON SIMPLE DEVICES THAT AUTOMATION + 0223658
3 IS NOT A MACHINE. R ATER IT IS A PROCESS. T HE CHIEF AIM OF AUTOMATION IS TO + 0223756
4 REDUCE HUMAN EFFORT AND HANDLING TO OBTAIN LESS ERROR. T HE SECONDARY AIM IS TO + 0223853
5 INCREASE THE PROCESSING SPEED. W E SHALL NOW ATTEMPT TO APPLY THE PRINCIPLES OF + 0223950
6 AUTOMATION TO D ATA P ROCESSING. + 0224045
7 D ATA PROCESSING IS THE PROCESSING OF INFORMATION. T HE HUGE VOLUMES CF DATA + 0224093
8 THAT MUST BE HANDLED EVERY DAY BY BUSINESS, SCIENCE AND GOVERNMENT STAGGERS THE + 0224193
9 IMAGINATION. I T IS PHYSICALLY IMPOSSIBLE TO PROCESS, CATALOGUE AND STORE ALL THE + 0224288
10 VAST QUANTITIES OF INFORMATION ACCUMULATED BY ALL SOURCES WITHOUT THE HELP OF MACHINES. + 0224367
11 A UTOMATED EQUIPMENT ENABLES US TO GATHER DATA, MANIPULATE IT, DRAW CONCLUSIONS + 0224488
12 FROM IT, AND STORE IT FOR FUTURE USE. R OUTINE HANDLING CAN BE PERFORMED AT HIGH + 0224584
13 SPEEDS, FREEING MEN AND WOMEN FOR MORE IMPORTANT TASKS. T HESE MACHINES CAN DO MANY + 0224682
14 OF THE TASKS THAT HUMANS FIND BORING WITHOUT BECOMING BORED. B ECAUSE OUR MACHINES + 0224782
15 DO NOT BECOME BORED OR TIRED, THEY MAKE VERY FEW MISTAKES. M OST ERRORS THAT DO + 0224882
16 OCCUR ARE THE RESULT OF HUMAN ERROR OR MACHINE MALFUNCTION. + 0224979
17 A LL INFORMATION HANDLING, OR DATA PROCESSING, GOES THROUGH A CYCLE. F IRST, + 0225052
18 THE DATA TO BE PROCESSED MUST BE ASSEMBLED. T HEN IT MUST BE RECORDED IN A CONVENIENT + 0225150
19 FORM. N EXT, IT MUST BE MANIPULATED. T HE RESULTS MUST BE REPORTED. F INALLY, + 0225251
20 IT MUST BE STORED. T HE NEXT SLIDE SHOWS THE DATA PROCESSING CYCLE IN SEQUENCE. + 0225350
21 P LEASE DEPRESS THE RESPONSE KEY.+ 0225447
22 TY //SS010 // + 0225494
FINISH + 0268859

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PAGE 001

YN *
GIN *
CIA *
CIAQ1 *
CIAQ2 *
CIAQ3 *
EC1B *
EC1BQ1 *
EC1BQ2 *
EC1B Q3 *
EC1B C4 *
EC1B Q5 *
EC1C *
EC1C Q1 *
EC1C Q2 *
EC1C Q3 *
EC1C Q4 *
EC1C Q5 *
EC1TEST *
TEST1Q2 *
TEST1Q3 *
TEST1Q4 *
TEST1Q5 *
TEST1Q6 *
TEST1Q7 *
TEST1END *
SCRT1A *
SCRT1B *
SCRT1C *
SCRT1D *
SEC2 *
FINISH *

0203451
0203502
0204630
0205936
0207080
0207843
0208772
0210407
0211177
0211756
0212360
0213095
0213589
0214772
0215547
0215979
0216759
0217422
0218416
0218774
0219214
0219573
0220502
0220869
0221282
0221781
0222363
0222638
0222906
0223174
0223563
0268859

APPENDIX II

List of Visitors

Partial list of visitors to Providence College Computer Center to view and try Computer Assisted Instruction techniques.

1. National Teachers Corps enrollee's from Rhode Island College.
2. Reporter from the Providence Journal/Bulletin.
3. Reporter and Photographer from the Pawtucket Times.
4. Representatives from Harvard University Bio-Medical Department, Dr. Lawrence Stolurow: department head.
5. Providence School Superintendent; Dr. Charles O'Connor.
6. Various priests and nuns from the Providence Diocese School Department.
7. Instructors and students from Rodman Job Corps Camp at New Bedford, Mass.
8. Representatives from Entelek Incorporated of Newburyport, Mass.
9. Mrs. Patricia Duffy, Vocational Education Coordinator Pemberton Township School District, Pemberton, New Jersey.
10. Dr. Sidney High, United States Office of Education.
11. Mr. Kenneth Mellor, Manpower Development Project Supervisor, Rhode Island Department of Education.
12. Dr. Finger, Rhode Island College.
13. Representatives from various departments of Brown University.

APPENDIX III

Reprint "Pawtucket Times", August, 1966

This 'Teacher' Takes Nobody's Back Talk

The pupil hesitates, glances around, fiddles with a shirt button, and makes a guess. It's wrong.

"Sorry about that. Let's make one further attempt at the correct answer," the "instructor" says.

Surrounded by concrete block walls and electronic gadgetry, the pupil stares at the "teacher." An oversized electric typewriter. "Sorry, wrong again," the thing chatters. "The correct answer is. . ."

Hardly fantasy, this scene actually took place recently in the computer center of Providence College. There, four men are among a group programming an IBM 1401 computer to be a teaching machine.

"Why, this thing could eliminate teachers!" the pupil exclaimed. Commenting later Robert Reynolds, of Providence, a teacher at Tolman, smilingly disagrees. "It will definitely serve to supplement teachers and use them to the best advantage, though."

Mr. Reynolds is chairman of the coordinating committee charged with writing courses in various subjects for the computer to teach. Others in the committee are Edward P. Sherlock of 22 Miles Ave., Pawtucket, and George J. Grant of 120 Dexter St., Cumberland, both from Pawtucket Vocational High School, and Chase E. Loomis, 161 Balch St. Pawtucket, who teaches at Barrington High.

Their project, which is one of 14 in the nation underwritten by the U.S. Department of Education, is aimed at students on the high school level. Mr. Reynolds has written a program on introductory data processing, and Mr. Sherlock on introductory electrical studies.

The typical instruction program goes something like this: The pupil is asked to identify himself through code words which he types out on a "terminal": in this case, the

oversized typewriter. On the same typewriter, the computer explains the purpose of the particular course, and then proceeds to present information and ask questions.

The thing that brings the project many steps beyond being a mere electronic textbook is that it treats the pupil as an individual. "I have written one program that takes 22 pages," Mr. Reynolds said. "An outstanding student could finish it in 10 minutes. A slower student could spend hours."

"The student sets his own pace, and is not handicapped if that pace is different from the rest of the class" the Tolman teacher said.

There are several reasons why these machines will never replace teachers — the main one being that nothing will ever replace the desire to please a human, flesh and blood professor.

But his computer substitute holds out a seemingly unlimited number of uses for the future.

Schools as we know them could be eliminated, the computer specialist theorizes. Instead of spending millions to house pupils in school buildings, their education could be brought to them by installing the terminals of such a computer in a student's home.

The possibilities seem only to be limited by man's imagination.



COMPUTOR programmer Edward Sherlock, seated, acts as pupil to test electronic "brain" that he and, from left, George Grant, Robert Reynolds and Chase Loomis are programming to become a mechanical "teacher."

APPENDIX IV
Time Utilization Table

TIME UTILIZATION TABLE

<u>Activity</u>	<u>Hrs. Wkly.</u>	<u>Period</u>	<u>Total Hrs.</u>
Formal Instruction	2	1 hr.	12
Role of Proctor	2	1 hr.	12
Use of 1050	2	1 hr.	12
Discussion	2	1 hr.	12
Entry and Testing	2	2 hrs.	24
Participant Preparation	15*	--*	90*
	<hr/> 25		<hr/> 162

* No actual time record was kept by participants. However, several participants estimated their own time at 15 hours of work outside committed or allotted time.

APPENDIX V

Participants and Course Title

PARTICIPANTS AND COURSE TITLES

PARTICIPANTS

Robert G. Brooks
Joseph DeFusco
Joseph A. Depasquale
Edward A. DeSanto
George J. Grant
Chace E. Loomis, Jr.
Arthur Montanaro
Amato Nocera
Robert R. Reynolds
Edward P. Sherlock
Allen F. Swann
Raynond Szefflinski
Frank R. Walker, III

COURSE TITLES

Business Law Vocabulary
Survey in General Insurance
Introduction to Transistors
Basic Electric Arc Welding
Special Factors in Math
Automobile Insurance
Filing
General Mathematics
Introduction to Data Processing
Basic Electrical Theory
Basic Data Processing
Postal Services
English Grammar

APPENDIX VI

Communities and Schools Represented

COMMUNITIES AND SCHOOLS REPRESENTED

<u>HIGH SCHOOLS</u>	<u>COMMUNITIES</u>	<u>STUDENTS</u>
Barrington High School	Barrington, R. I.	1
Coventry High School	Coventry, R. I.	2
Cranston High School	Cranston, R. I.	1
Pilgrim High School	Warwick, R. I.	2
Tolman High School	Pawtucket, R. I.	1
Warren High School	Warren, R. I.	1

<u>VOCATIONAL SCHOOLS</u>	<u>COMMUNITIES</u>	<u>STUDENTS</u>
Pawtucket Vocational High School	Pawtucket, R. I.	2
Vocational Tech. School of Rhode Island	Providence, R. I.	3

APPENDIX VII

Basic Computer Assisted Instruction System

BASIC COMPUTER ASSISTED INSTRUCTION SYSTEM

1. Software: Basic IBM Coursewriter Programming Language*

2. Hardware:

QUANTITY

ITEM

1

1401 Central Processing Unit

1

1402 Card Reader-Punch

1

1403 Line Printer

1

1409 Model 2

2

1026 Transmission Control Unit

2**

1050 Data Communications System

* As adapted by the University of Texas to allow batch-loading of punch cards.

**One 1050 Data Communications System has been modified to utilize a slide projector and a tape recorder. This unit serves as the master terminal.

APPENDIX VIII

Report of Technical Difficulties

DIFFICULTIES ENCOUNTERED WHILE OPERATING COURSEWRITER

- I) -Loss of continuity of course material
-Loss of course material
-Branching to improper course material

All three problems can be linked to the same weakness of the original CAI system. In order to explain the problem involved it is necessary to consider in some detail the medium of storage employed by the CAI system. This medium is a relatively high-speed external storage device called a disk. Since disk storage is not basically a sequential storage medium, some means of identifying the location of the desired material on the disk must be available. The physical location of a record on a disk lies within a sector of the disk; each sector having a unique address.

Therefore, if course material is to be stored on a disk and a course is to maintain a logical continuity, it is necessary to obtain from the course record presently being processed by the CPU, the physical location of the next logical record; not necessarily sequentially stored. This portion of the record is called a pointer, since it literally points to the physical location (address) of the next logical record of the course. If an author should desire to insert some material in his course, the CAI system would physically position this material at the end of the course.

To maintain the logical continuity, it would be necessary to

- a. Break the chain of pointers at the logical point of insertion
- b. Cause the pointer in the record preceding the insertion to point to the first record of the inserted material, and
- c. Cause the pointer of the last record of the inserted material to point back to the record that should follow logically; i.e. a so-called "link-up" and "link-back" would have to be established.

If at any time during this process of insertion, the CAI system should be interrupted, either by a hardware malfunction, a software failure, or just plain author error the "link-back" address would be lost and data of an indeterminate nature would be inserted in the "link-back" pointer of the last record inserted. The inserted course material still would be available to the user however, the course would lose its logical continuity after reaching the end of the insertion since no connection had been established to the next logical record. This condition would invariably lead to an interrupt condition, causing the breakdown of the system and possibly the destruction of valuable course material. In conjunction with this problem, the physical location of some special function keys on the IBM 1050 keyboard has shown to be the principle reason for author error. The manufacturer has been informed concerning this.

II) -Inability of the advanced version of Coursewriter to address the IBM 1050 terminals present at Providence College.

During the course of this contract, we obtained from the University of Texas an improved version of Coursewriter. The original version, as supplied by IBM, under an inflexible system of console addressing, restricted the modes of console operations. For example, the proctor (supervisor of the system) could exercise his functions only from the first console of the system, virtually chaining him to that device and also removing one terminal from classroom usage, since this terminal had to be placed in the immediate vicinity of the computer itself.

The CAI system obtained from Texas U. permitted the proctor to control the system from any console, thus releasing one further terminal for student and author usage. To make use of this flexibility, the terminal addresses; i.e. the codes by means of which the CPU gains access to a terminal were changed. Since we had insufficient documentation on the Texas system, the lack of any response from the terminals was first attributed to a software malfunction. After extensive debugging and consultations with personnel from the local IBM Branch Office and experts from the Advanced Maintenance and Development Department of the IBM FE Division in Poughkeepsie, N. Y., it was determined that the terminal addresses employed by the original version of Coursewriter were sufficiently different from the codes used by the Texas system to prevent any response at all from the terminals.

Once this fact had been established, a relatively simple change in the wiring of the IBM 1050 terminals involved remedied the situation. No difficulties have since been experienced in this particular part of the CAI system.